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i. INTRODUCTION

The Palestinian Water Authority (PWA) was founded in 1995 as a central and autonomous authority under Presidential Resolution No. 90. Its powers and responsibilities were defined in By-law No. 2/1996. The PWA is the main regulatory and policy-making body for water resources management and development in both West-Bank and Gaza. It is in charge of regulation, comprising tariff review, water law and legislation, water extraction licensing and monitoring, overall sector planning and coordination, and establishing standards for drinking water and wastewater quality, as well as other technical standards. This Background Information came to present to the readers in (4) chapters the most basic needed information that one should know about the water sector.

- Chapter one: gives brief view about the historical background of the water sector and its legal framework development.
- Chapter two: shows the institutional framework of the water sector and the role of each level.
- Chapter three: presents the water policy and strategy that lay down the basis for efficient and equitable water management in Palestine.
- Chapter four: presents brief aspects of water resources in Palestine.

1.HISTORICAL BACKGROUND

Palestine is located in a semi-arid region of the Middle East with limited water resources that are already under considerable strain due to the overall demand in the region exceeding the available water supply and the deterioration of the quality of the natural water resource.

In addition to the natural constraints, Palestine has also suffered from the imposition of artificial restraints resulting from the conditions of Israeli occupation under which Palestinians have lived since 1967 as well as the colonization program which has more than 185 Jewish settlements constructed under its umbrella.

Legislation in Palestine is complicated. Throughout history, were laws and other related laws were introduced by governments and occupiers. The prevalence of the interests of the occupying powers over the needs and interests of the Palestinian citizen is reflected in most of the legislature. The use of the natural resources derive from the plans, interests and goals of the occupying powers, and the written laws therefore often contradict the interests of the indigenous people.

Since 1967 the Israeli policy, as regards water allocations in the West Bank and Gaza Strip, has deprived the Palestinian people of their basic human rights for adequate water quality and quantity, thus hindering socio-economic development in the Palestinian areas – particularly in agriculture which could form a major growth platform for the Palestine economy in its present low state of development.

Israel has imposed stringent restrictions on the Palestinians concerning the development of their water resources. This policy has ignored the basic principles of international law and the United Nations Resolutions adopted in that regard. Although actually dating back to year 1948, the policy was publicly revealed after the 1967 war when Israel declared all water resources in the region as State Property (Proclamation No. 2: 1967).

This Proclamation was followed by many military orders prohibiting the Palestinians from developing their resources. For instance: the development of new deep wells to meet demand is strictly curtailed; extraction from existing wells is closely monitored; and supplies from the Israeli transmission network to Palestinian towns is often withdrawn so that Israeli seasonal agricultural demands can be prioritized.

Present water administration and regulations in Palestine are derived from Islamic water law principles together with concepts and interpretations which have been imposed on pre-existing regulations, local uses and customs. Some of these superimposed laws date from the last century, promulgated by the Ottomans. Others were enacted by the British mandate power during the 1930s. between 1952 and 1967 the Jordanian government enacted several laws. The water laws and many other related laws were changed and amended in Jordan and Egypt after 1967.

The PWA has been given the mandate through By-law No. 2(1996) to manage the water resources, execute the water policy, establish, supervise and monitor water projects, and to initiate coordination and cooperation between the parties affected by water management. The Water law which has been signed lately by the President mentioned and assured these responsibilities, The Water Law include within its articles the institutional framework of each levels in the water sector, the roles of each level, and some water regulations, etc.

The water sector in the West Bank and Gaza Strip, is one of the most important strategic sectors for the Palestinian Authority, having been underdeveloped over the past thirty years. This was as a consequence of the imposed, strict Israeli water sector Military Orders in Palestine. These orders have kept the control of the Palestinian water resources under Israeli control, and did not permit any Palestinian water institutions of water resources. Moreover, the existing Palestinian institutions were

restricted to operating and participating in an extremely limited range of activities regarding water supply administration, including operation and maintenance. Therefore, there has been no chance of promoting a new water institution, nor strengthening the existing ones to be involved in formulating water plans and strategies for Palestine. Against this background, a considerable disparity appeared between growing needs and the services supplied. Large parts of the community, especially in rural areas (37% of the population), have been deprived of any kind of services. The infrastructure has not been developed in these areas and, moreover, the water infrastructure installations in urban areas have deteriorated over the past thirty years, becoming insufficient or meet the needs of the community. This was due to a number of reasons, such as:

- The water installations were not designed to meet the needs of the community over a thirty year period.
- High loss percentages, through pipe leakage and illegal connections, have enlarged the gap between the actual and the recovered costs of the supplied water. This has in turn weakened the economic status of the water institutions to a level that it became hard to rehabilitate their infrastructure installations (pumping stations, networks, etc.).
- Until the establishment of the Palestinian Water Authority (PWA) in April, 1994, there was no single institution responsible for modifying the existing plans and conducting new ones, that could meet the various water-related demands of the community.

Despite all these difficulties, the challenge of developing the water sector has always been the Palestinians' top priority. The non-existence of a national government planning body has had a very detrimental effect on the water sector. Nevertheless, the existence of non-governmental water institutions (NGO's) has played an important and unique role in building up a water professional team which has been involved in monitoring and developing the available water resources. Moreover, they have been successful in highlighting the seriousness of the water problems locally and internationally. They also have been the major source for water related information, and were thus acting as the national planning bodies in this regard.

2. INSTITUTIONAL FRAMEWORK OF THE WATER SECTOR

The roles and responsibilities in the water sector in Palestine were scattered fragmented and unclear. For the last 30 years of occupation, this continued situation of mixed roles and responsibilities in the water sector has led to inefficient management and uncoordinated investments. When Palestinian Water Authority (PWA) has been established it found an urgent need for restructuring the water sector in order to regulate, monitor and control the managerial, technical and financial performance at the national, regional and local levels.

The institutional reforms within the water sector have adopted some principals for water policy, and three important principles are:

- The water sector should be regulated by one responsible body, with the separation of the institutional responsibility for policy and regulatory functions from those of service delivery;
- It is intended to establish three regional utilities in the west bank and one in Gaza; and
- Encourage involvement of the private sector in the funding and implementation of projects.

In response to these principals, the overall institutional framework of the water sector is as follows:



2.1 The National Water Council “NWC” (Policy Making Level)

The NWC is chaired by the President of the Palestinian National Authority (PNA) and consist of five ministers, six other members representing government and non-government organizations and the head of the PWA as the secretary of the Council. The members of the NWC comprises to review and approve national water policy, review and approve quotas, reconsider the issue of private ownership of water, examine the central water projects and approve their implementation, and enhance regional and international co-operation in water.

2.2 The Palestinian Water Authority “PWA” (Regulatory Level)

2.2.1 Overall Development Goals of PWA

In addition to the main challenge of securing the future water rights of the Palestinian society the overall development goal of PWA includes achievement of economic growth through securing the water rights of the Palestinians and enforcement of equitable allocation of water resources among sectors and achieving environmental aims through the effective conservation and protection of these same scarce resources. In other words, PWA also has a fundamental responsibility in contributing to

reduction of poverty and to promote water security and prosperity of the Palestinian People. PWA has a major challenge in translating this “development goal” into a realistic and operational “vision”.

2.2.2 PWA’s Mandate

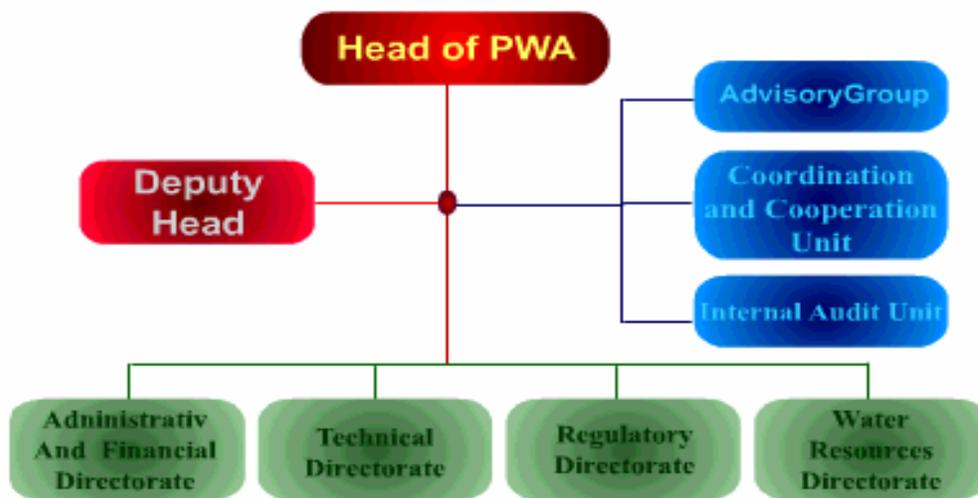
The Palestinian Water Authority (PWA) is a central public authority established under the presidential resolution No. 90 of 1995, acting under the direct responsibility of the President of the Palestinian National Authority. PWA is the main regulatory body for water resources management and development in Palestine with the following primary objectives:

- Execute the National Water Policy as approved by the National Water Council;
- Ensure most efficient management of available water resources in Palestine;
- Seek to achieve and develop water security through optimal planning and management of water resources and explore further resources to ensure balanced management between supply and demand;
- Set standards and establish technical specifications to assure quality control of water works.
- Licensing the exploitation of water resources including the construction of water projects.
- Seek to achieve strong co-operation between PWA and other relevant parties.

2.2.3 PWA Structure

The PWA, as described in the Water Law is a governmental institution with a juridical personality and its budget shall be included within the general budget and follows the President of the Palestinian National Authority and has a commissioner who is appointed by its President. PWA is responsible for the management of the most scarce and vital sources for sustaining life, for promoting development, and for maintaining the environment in Palestine. Water is in focus of the attention in the general public and the media.

The organizational structure of the PWA includes the following directorates and functions:

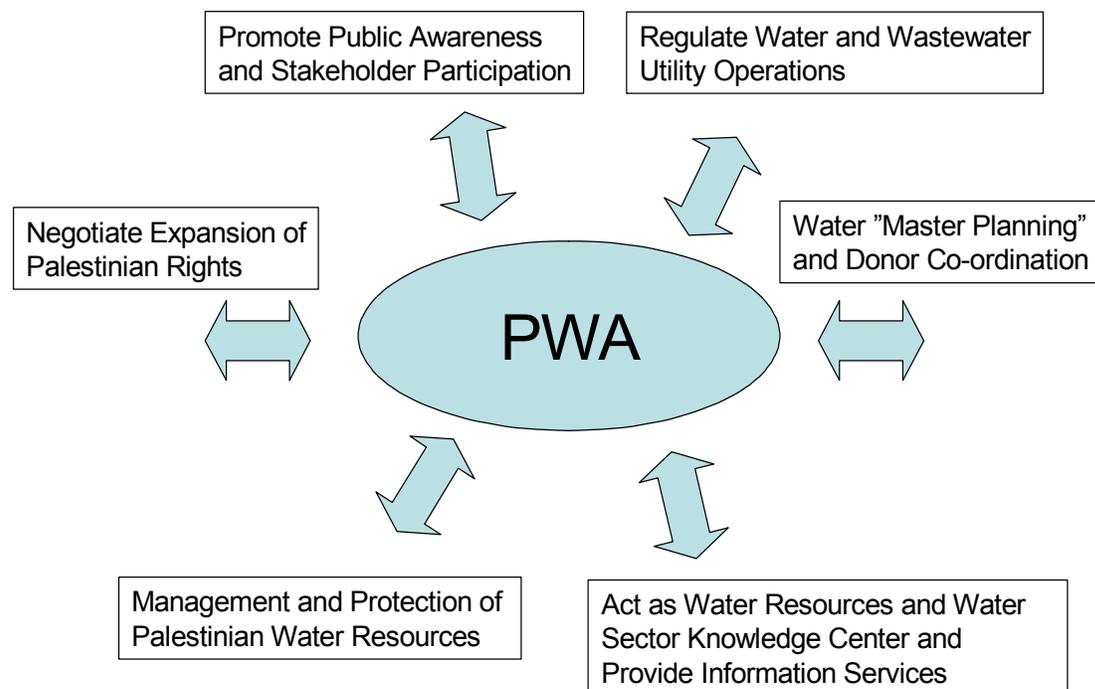


2.2.4 PWA's Core Functions

In brief, the main core functions and challenges associated with PWA in serving the Palestinian society as a statutory water sector regulator are the following:

1. Support negotiations on expansion of Palestinian Water Rights towards gaining control over its equitable share of the region's water resources;
2. Be in charge of management and allocation of water resources including issuing and supervision of water abstraction licenses;
3. Provide water resources and water sector information services;
4. Undertake water "master planning" functions;
5. Take charge of donor co-ordination within the water sector;
6. Be a regulator of water and wastewater utility operations;
7. Promote public awareness, stakeholder participation and mutual trust among interest groups.

PWA's Services to the Palestinian Society



2.2.5 PWA in Transition

Since it was established in 1995, PWA has been through a difficult process of establishment and consolidation and at the same time was involved in resolving urgently needed planning and implementation tasks.

During the interim period, an important task for PWA is to implement all agreed elements of Article 40 of the Oslo II Agreement. This requires a lot of physical planning, engineering and project implementation skills. When the new water utilities gradually take over more of the planning, design and construction supervision tasks, PWA will have to dedicate more resources to its primary functions as a strategic and regulatory body. In due time the focus will turn to representation of Palestinian interests and rights in bi-lateral and regional contexts, and it is necessary to continuously build capacity to meet these important challenges. The capacity building program will have to include training for existing staff in water resources and project management.

One important factor which will need specific attention is motivation and dedication of the staff to play as a team with the common goal of enabling PWA to resolve important water resource challenges facing Palestine. The latter is highly dependent on the attitude and capability of the leaders and their ability to identify relevant tasks and appropriate training and career opportunities for PWA's staff. It should be noted that the development of the regulatory and water right negotiation capacity is a time-consuming process, which has to be considered in planning the recruitment and training programs currently under preparation.

2.3 Service Delivery level

The main elements of the water and the wastewater sector policy adopted by the PNA are based upon the principles of sustainable development. The adoption and implementation of discreet national water policy endeavored to insure that domestic, industrial and agricultural capital investments are compatible with the availability, development, and conservation of the Nation's water resources.

2.3.1 Bulk Water Supply Utility:

The Palestinian Authority is considering the implementation of a new water policy framework, aiming at setting up an autonomous Palestinian Bulk Water Supply Utility, which would take over the management of Trans-regional bulk water supply systems, comprising:

- existing transmission lines, currently operated by WBWD, providing bulk water supply to Palestinian communities,
- water projects, which are currently developed by the Palestinian Water Authority (PWA),
- other water sources envisaged in the National Water Plan (NWP),

The Bulk Water Supply Utility would be licensed by PWA to operate water production facilities, purchase drinkable water from national and international suppliers, convey the water to local Municipal and Industrial water distribution systems; the operation, maintenance and management of those local water distribution facilities will be progressively taken over by four Regional Water Supply Utilities that are established by the new Water Law.

Based on the Norwegian study (1997) and the updated PWA study in 1999 on WBWD, which recommended the needs for its institutional development. Therefore, PWA Signed an agreement with

the French Government to support the development and restructuring of the WBWD. French Company has been selected to conduct a study for Institutional Evolution and Action Plan Outline including a Request For Proposal (RFP) for Management Contract to create the Bulk Water Supply Utility, improve its management and develop its technical efficiency.

2.3.2 Regional Utilities

The water industry can be characterized as being “fragmented”. Water departments within the municipalities and village councils operate and maintain the water systems within their service areas. The customers are found to be complaining from an insufficient water supply, deterioration of water quality and inadequate level of services. Therefore, and in order to create a more efficient and sustainable sector, the PWA has adopted the strategy of creating four Regional Utilities in the service delivery level. They are divided geographically;

- Northern Utility (Nablus, Jenin, Tulkarem, Qalqilia, Salfit and Tubas Governorates),
- Central Utility (Jerusalem, Ramallah and Al-Bireh and Jericho Governorates)
- Southern Utility (Hebron and Bethlehem Governorates)
- Coastal Utility (Gaza Strip Governorates)

3. WATER RESOURCES MANAGEMENT STRATEGY

Strategy Statement

To secure an environmentally sound and sustainable development of water resources, through efficient and equitable water management

Key Elements of the Water Management Strategy

- 1- Secure Palestinian Water Rights.**
- 2- Strengthen National Policies and Regulations.**
- 3- Build Institutional Capacity and Develop Human Resources .**
- 4- Improve Information Services and Assessment of Water Resources.**
- 5- Regulate and Co-ordinate Integrated Water and Wastewater Investments and Operations.**
- 6- Enforce Water Pollution Control and Production of Water Resources.**
- 7- Build Public Awareness and Participation .**
- 8- Promote Regional and International Co-operation**

3.1. Background and Introduction

The increasing unavailability of water resources to the Palestinians, combined with the associated political complexity related to this valuable resource, have urged the Palestinian Authority to formulate the main principles of the national water policy which lay down the basis for efficient and equitable water management in Palestine. The Palestinian Water Authority (PWA) has been authorized through By-Law No. 2 (1996) to execute this policy and to prepare an overall water Management Strategy. The ultimate goal of strategy formulation is to provide measures to manage this vital resources in accordance with the adopted goals and policies.

The PWA initiated and has produced the draft strategy document. A Task force with members from the PWA staff has been established to assist in the work. The views of the main stakeholders in the water sector were also incorporated in order to create involvement and commitment for the implementation of strategy. The PWA has also consulted with a wide range of Palestinian NGOs, other international organizations in addition to individuals and the private sector.

3.1.1 Water Resources Availability

The sources of the water in the West Bank are those renewable fresh waters of the mountain aquifer which are estimated to be 650 mcm /year, in addition to the surface runoff in the Wadis, estimated to be 70 mcm/year.

The Gaza Coastal Aquifer is essentially the sole sources for water in the Gaza Governorates, a shallow aquifer that underlies the entire Gaza Governorates and extends northward into Israel. The natural renewable recharge is in the order of 45 mcm/year .

The Jordan River system has a natural capacity to deliver an average annual flow of 1311 mill.m³/year. The riparian of the Jordan River are Lebanon, Syria, Palestine and "Israel" and Jordan Palestine's annual share from the Jordan River Basin has been estimated to be 20% of the total annual flow. As a result of water diversion of the upper Jordan River tributaries by the Israelis there is no fresh water down stream of Lake Tiberias, and the negligible quantity that reaches the Palestinian Riparian in the West Bank is of a deteriorated quality .

3.1.2 Water Uses and Consumption

Palestinian total use from the groundwater resources in the West Bank has been estimated to be 120 mill.m³/year. About 86 mill m³/yr. (71%) is used to irrigate 90,000 dunms. The remaining 34 mill.m³/yr. are used for domestic and industrial consumption (industry's share about 3%) with more than 40% of unaccounted for water .

In Gaza, Palestinians total use of water is about 125 mill.m³/yr. is used to irrigate 120,000 dunums . The remaining 45 millm³/yr are used for domestic and industrial consumption (industry's share about 3% with more than 50% unaccounted for water . The water crises in Gaza is not limited to the deficit in quantity. However, the water quality is deteriorating and subject to continuous increase in salinity due to over-abstraction and to the percolation of sewage in the area.

At present, Israel is currently controlling 85% of the water from the Palestinian groundwater aquifers, and Palestinians are denied from their rights to the water of the Jordan River and Gaza Wadis. This policy has led to a severe water crises in Palestine in general and the Gaza Governorates in particular.

3.1.3 Water Demand

The Unique historical water situation in the West Bank and Gaza Governorates has resulted in suppressed water demands. Water Supplies are generally constrained due to technical, institutional and political limitations. In addition to that, approximately 30% of Palestinian Communities are not served while 66% of the served communities suffer from water shortage especially in summer. Thus the current water demands cannot be used for predicting future demands.

Future demand projections should take into account the aforementioned facts in addition to normal assumptions used in predicting demands, like population growth and socio-economic development requirements.

Many studies conducted recently have indicated that the gap between supply and demand will increase dramatically in the coming few years, thus making the Palestinian's water right issue both a necessity seek feasible alternatives and options in order to fill this gap.

a. Domestic Water Demand

The target rates for domestics water consumption in order to bridge the gap between supply and demand falls within a range of 100 l/c/d and 150 l/c/d. These rates will be hopefully met after 10 and 20 years respectively with a target to reduce the loss rate to 25% over a 20 year period.

b. Agricultural Water Demand

Agriculture is considered one of the major economic sectors in Palestine. Its production contribute more than 30% to national income. Accordingly, there will be much emphasis regarding the development of irrigated agriculture in Palestine. The potential area for irrigation is estimated to be 500,000 dunums. The projection of potential agricultural water demand is estimated to be 200 mcm over the coming 20 years. Treated wastewater is enlisted to be a support resource to irrigated agriculture .

c. Commercial and Industrial Water Demand

Due to lack of detailed economic industrial development plans for Palestine, it is not possible to base estimates of future commercial and industrial demand on economic projections. As a result, projected industrial and commercial water demands have been calculated as assumed percentage of the total water consumption in Palestine. These future demands are estimated to be 9% of the total consumption over a 20 year period .

3.2. Opportunities and Challenges

3.2.1 Political Framework and Challenges

a. Declaration of Principles

This is the first Bi-lateral Agreement between Palestine and Israel signed on 13 September 1993. According to this agreement, water issues will be discussed by the Permanent Palestinian Israeli Committee for Economic Co-operation. It was agreed to prepare plans for water rights, and equitable use of water for the shared resources. However, this agreement did not identify the water right for each party.

b. Gaza Jericho First Agreement

Which is the temporary Agreement regarding autonomous rule of the Palestinian Authority in Jericho and the Gaza Strip, signed on 4 May, 1994. Article 2 paragraph 31 deals with the water issues in the two regions. A limited authority on water uses was transferred to the Palestinian Authority. The Palestinian Authority has control over the water resources, infrastructure in the two regions, and it can operate and manage the water systems. New wells can be drilled on condition that the water resources are not harmed. Nothing in this agreement has been mentioned on the water rights issue, equitable use or the allocation of shared water resources.

c. Article 40 of the Oslo 2 Agreement regarding Water and Sewage

The interim water and wastewater Agreement “Article 40” of Oslo 2 will be used as the basis for water sector planning and project implementation during the “interim period” and until a final status agreement is reached . these will be negotiated and settled in the Permanent Status Agreement relating to the various water resources “

The main challenge facing the Palestinian is to achieve sovereignty and full control over their water resources. It is most urgent to resolve the Palestinian water right issue, which comprises securing comprehensive control and management of their water resources, including the ground and surface water totally originating inside the West Bank and Gaza Governorates, in addition to the riparian rights in the Jordan River Basin and Gaza Wadis. The Control over the water resources is the basis for the development and management of these water resources in order to meet the needs for water for further economic development

d. Palestinian Position from the Final Status Negotiations

The requirements of the Palestinians from the final status negotiations are based on the following aspects:

1. Full sovereignty and control over their own water resources which includes the ground and surface water originating within their area of jurisdiction and their riparian rights of the Jordan Valley Basin.
2. Continue the co-operative efforts in all regional activities and plans in order to guarantee in order to ensure that resources between the neighbour countries are optimally shared.

3. To establish a joint resolve among their neighbors in the development of New and Additional Water Resources.

Going to negotiations with a solid legal (negotiation) position that is based on international legitimacy. This approach will definitely provide us with support from the international community and will, consequently, constitute an advanced negotiation position at the outset of negotiations.

First: Political Aspects :

- Examination of the willingness of the Israeli side to acknowledge the Palestinian permanent and actual sovereignty over water resources, which will be determined and agreed upon within the framework of the permanent agreement .
- Checking the Israelis' intention towards compensation for damages incurred by the Palestinian side during occupation and as a result of the Israeli procedures taken in the field of water.
- Israeli's acceptance of the Palestinian demands, concerning refusal of the existing utilization of ground water resources in the West Bank .

Second: Technical Aspects:

- Concerning our water rights to water resources within the borders of the West Bank and Gaza Strip :

- **Easter aquifer system wholly located within the borders of the West Bank.**
Our demands: total and permanent Palestinian sovereignty coupled with actual control over all resources of the aquifer, whether ground or surface.
- **Western and northeastern aquifers system - The geographic and hydraulic borders of these aquifers extend into the Green Line with Israel.**
Our demands: re-distribution of the water resources of these aquifers, on the basis of equitable and reasonable distribution principle, without any precedent conditions, and to dismiss the statement which says it is necessary to honor the Israeli's current utilization .
- **Water aquifers within Gaza Strip:**
Our demands: total & permanent Palestinian sovereignty and actual control over watercourses inside Gaza Strip .
-Jordan River System:

Our demands :

A - To benefit from the aquifer's surface water resources, in accordance with the equitable utilization principle, and not to recognize the existing utilization by the Israeli side.

- B - Complete participation in the aquifer management, and at the same level with other countries riparian in this aquifer .
- C - To get a commitment from the Israeli side to pump the Palestinians' share of water from the aquifer through Lake Tiberias, by a pipeline or canal connecting between Lake Tiberias and the Valley area at the starting point of the northern borders of the West Bank along the Jordan River.

Third: Coordination & Cooperation:

- To develop the work of Joint Water Committee)JWC ,(in order to perform control, inspection and supervision over implementation of the final agreement. This shall be in accordance with an agreed upon work mechanism forming an integral part of the final agreement .
- To Cooperate in the field of water in order to develop the available local water resources, and to search for new water resources for the interest of both sides .

3.2.2 Socio-economic Aspects and Challenges

Economic development is to a large extent dependent on adequate water supply. Both Agriculture and wide range of industries depend on water. However, the current pricing system in both the West Bank and Gaza Strip does not reflect the real value of water, since it is not based on an economic analysis to estimate this value.

In the national Water Policy, water has a high social , environmental and economic values. Accordingly this resource has to be managed in terms of both quality and quantity in an economically effective manner. A tariff policy has to be adopted in order to ensure both the efficient use and conservation of water. This Tariff policy also has to take into consideration the social conditions of the people including affordability , i.e. the ability to pay .

3.2.3 Institutional Aspects and Challenges

The PWA has been given the mandate through By-Law No. 2 (1996) and has been stressed on in its amendments Law no.7 for 2002 to manage the water resources, execute the water policy, establish supervise and monitor water projects, and to initiate co-ordination and co-operation between the parties affected by water management.

In the same jurisprudence, the “ National Water Council” was also established. The council consists of the president of the National Authority as Chairman and members from the ministries involved in water issues, with the PWA as Secretariat. The main objective of the Water council are to approve the National Water Policy and to support the work of the Palestinian Water Authority .

It is a major challenge to develop PWA rapidly into a well functioning authority and at the same time to follow-up and coordinated the projects that are restructuring the water sector institutions. In that context the PWA has been authorized to oversee the work of the West Bank Department as a bulk utility in order to ensure that technical and managerial performance is improved .

The PWA will also establish regional utilities in the West Bank and Gaza Strip. These utilities will have an autonomous status both administratively and financially, and will have to operate on the basis of cost recovery principles. The strategy will in the long term encourage the involvement of the private sector in the implementation of certain projects and possibly the management of services that could be contracted out by the utilities.

3.2.4 Environmental and Health Aspects and Challenges

Water has a high environmental value. It is essential for life and necessary for an acceptable hygienic standard, but can also be the carrier of serious diseases. A secure and adequate water supply is thus a necessary condition both for the personal well being of people and for a proper level of public health.

A deficient domestic water supply (in quantity as well as quality) is not only detrimental to general welfare, but also a direct economic liability to society, through increased load on the health and social services, and through increased absence from work.

Generally, it is not possible to achieve high quality and secure water supply without proper handling of sewage. Therefore, concept integrated management for water and sewerage will be the ideal solution for efficient management in the water and wastewater sectors.

3.3. National Water Policy

Palestine must develop and manage its water resources efficiently in order to meet present and future water needs in an environmentally sustainable way. The main elements of the Palestinian Water Policy, based on the principle of a sustainable development, have been established as a basis for decisions on the structure and tasks of water sector institutions and water sector legislation. This policy lays down the principle of integrated water resources management and stresses an economic sustainable development of all available water resources.

The development and the management of the water resources in Palestine must be coordinated on a national level and carried out on the appropriate local level. This should ensure that domestic, industrial and agricultural development and investments will be compatible with the quantity of water resources available and economically feasible.

The Palestinian Water Policy, as set out in the following principles, will be the basis for decisions on the structure and tasks of water sector institutions, the water sector legislation and the management strategy:

- All sources of water should be a public property.
- Water has a unique value for human survival and health, and all citizens have a right to water of good quality for personal consumption's at costs they can afford.
- Water supply and domestics, industrial and agricultural development must be compatible with the available water resources and based on a sustainable development.
- Water has social environmental and economic values. Therefore, the damage resulting from the destruction of its usefulness (pollution) should be paid by the party causing the damage (polluter), polluter pays principle.

- The development of the Palestinian water resources must be coordinated on the national level, and carried out on the appropriate local level.
- The national water sector management should be carried out by one responsible body; with the separation of institutional responsibility for policy and regulatory functions from the service delivery functions.
- Public participation in water sector management should be ensured.
- Water management at all levels should integrate water quality and quantity.
- Water supply and wastewater management should be integrated at all administrative levels.
- The optimal development of water supply must be complemented by a consistent water demand management.
- Protection and pollution control of water resources should be ensured.
- Conservation and optimum utilization of water resources should be promoted and enhanced.
- Pursue the Palestinians interests in connections with obtaining the right of water resources shared by other countries.
- The Government will co-operate with regional and extra-regional parties to promote the optimum utilization of water resources, to identify and develop new and additional supplies, and to collect and share relevant information and data.

3.4 Key Elements of the Water Management Strategy

The overall development objective of the Water Management Strategy is to translate the messages of the National Water Policy into strategic imperatives the strategy emphasizes the necessary aspects water development as the establishment of a comprehensive framework for sustainable management of Palestine's water resources. In addition to development of appropriate institutional set-up for reforming and strengthening the water sector in co-ordination with relevant stakeholders. This long term and coordinated strategy for the water sector will be used as an overall basis for the further planning of the activities and tasks in the water sector.

The overall objective for Palestine in the water sector is to secure an environmentally sound and sustainable development of the water resources through efficient and equitable water management. The multi-objective water resources management strategy builds upon the eight key elements which intend to meet this objective ad the challenges outlined previously. The key elements of the strategy are:-

3.4.1. Secure Palestinian Water Rights

This strategy emphasizes the Palestinian right for sovereignty and full control over their own water resources. The strategy for the short term is to define and pursue Palestinian water rights. A first step will be the implementation and full utilization of the water allocations committed in Article 40 of the Oslo 2 Agreement. The next step will be to prepare the negotiation strategies for the final status negotiations and finally to agree upon a final water agreement between Palestine and Israel .

3.4.2 Strengthen National Policies and Regulations

This strategic component responds to the need for improving the existing policy and the legal framework in the water sector by introducing new rules and regulations that provide incentives and enforcement mechanisms for sustainable water resources management and development

3.4.3 Build Institutional Capacity and Develop Human Resources

The long term strategy regarding the water sector institutions, is to achieve the most appropriate Institutional arrangement in the water sector based on the principles of sustainability. This includes the establishment of autonomous regional/local water utilities. For the Human Resources Development and executive capacity that is necessary for the water sector.

3.4.4 Improve Information Services and Assessment of Water Resources

The information management strategy is to develop a comprehensive information system on water resources with the required analytical capacity to deliver relevant information products to the decision makers, planners, development agencies and the public.

3.4.5 Regulate and Co-ordinate Integrated Water and Wastewater Investments and Operations

The overall strategy is to provide and co-ordinate the framework and strategic interventions and investments to ensure long-term water supply with sufficient quantity and quality for the water users, including the integration of wastewater services as a key element for improving socio-economic conditions in the country.

3.4.6 Enforce Water Pollution Control and Protection of Water Resources

The strategy is to develop the appropriate efficient legal regulatory and institutional instruments to enforce pollution control and protection of the water resources through coordinated efforts with relevant institutions.

3.4.7 Build Public Awareness and Participation

The strategy is to enhance public awareness and understanding about the particular importance of the scarce water resources, as well as to raise their knowledge on the management decisions taken in the sector. In addition to that to create the proper mechanisms and incentives for public participation in all stages of the project cycle.

3.4.8 Promote Regional and International Co-operation

As one of the core parties in the Peace Process, and as water is scarce in the region, Palestine commits itself to co-operate regionally and internationally to develop new and additional water resources and any other water related matters.

3.5 Scope of Work and Objectives

The overall objective for Palestine on the water sector is to secure the basic needs for water for all Palestinians on a short term and to meet the additional requests for water necessary for the development of the society and economic growth on a longer term, based on an equitable and sustainable water

management. In order to meet this objective and the challenges outlined in the previous chapters it is necessary to identify how to follow up the main elements of the water management strategy. PWA has therefore, for each of the seven strategic elements, identified the following strategies that will constitute the basis for the identification of the necessary actions, work tasks and day to day work.

3.5.1 Secure Palestinian Water Rights

Background

The increasing demands for water and the scarce water resources that will create tension and conflict within countries and among riparian states. This potentially serious problem needs to be addressed by Palestine through improved mechanisms to resolve conflicts and promote co-operation. Currently PWA is seeking to develop additional amounts of water for prioritized areas. A key issue in this context is the results of the final status negotiations on water rights.

Objectives

The objective is to develop strategic options, and mobilize a team of experts to support and participate in the negotiations of the final water rights and eventually to achieve and secure water rights.

Scope of work

The scope of work for the Palestinian Water Right Issues will include the establishment of an appropriate knowledge base require the development of consistent negotiation strategies and plans. It will be necessary to identify water rights and the activity should identify domestic expertise and need for short term international supplementary expertise to be assigned to this activity and to establish and strengthen a negotiation team. The work of this group would include, but not be limited to:

a. Mobilization of Water Rights Expertise

- Develop well defined objectives for the water resources which Palestine shares with Israel and other regional shared water resources.
- Evaluate possible benefits from existing treaties, agreements and international water right practices.
- Consultation with international water rights experts and elaboration on relevant principles for the Israeli Palestinian situation.
- Prediction of future water demands for the Palestinian people and for the economic activities.
- Reassessment of total/available water resources and data about the overall water balance.
- Propose appropriate mechanisms and measures for developing and/or strengthening legal instruments for the management of shared water resources.
- Carry out case studies by experts from the Palestinian Authority on other countries to learn about relevant experiences on different aspects of shared international water resources.
- Assess possibilities and constraints regarding non-conventional water resources including the option of re-use of wastewater and desalination of brackish or saline water.

1.2 Negotiation of Final Agreement

- Establish professional and competent negotiation team.
- Develop strategic options for the forthcoming water rights negotiations based on activity 1.1.
- Fulfillment of the negotiations.
- Evaluate and negotiate long term options for “import” or exchange of water resources to address anticipated future gaps in available water resources.

3.5.2 Strengthen National Policies and Regulation

Background

Adequate and effective water policies, legislation and regulations are important elements in enabling an environment for efficient water resources management. Even if the Palestinian Authority has made significant progress in formulating and implementing its water policy and water laws, there is still much to do to further develop and settle these reforms and to secure their implementation and long-term viability.

Objectives

The overall objective is to clarify the implications of the current laws and regulations, and to develop a complete and enforceable set of rules and regulations for the water sector which will serve as an appropriate basis for PWA to undertake its regulatory and development functions. The specific objectives of the water policy and regulation activity are to: (i) review existing laws, legislation and regulations affecting water management and to recommend measures for modifying and strengthening them and proposing new laws for effective management of the water resources; and (ii) develop the necessary regulatory tools and to perform the regulatory functions of PWA.

Scope of Work

The legal and regulation framework for the water sector will be upgraded through the Water Rules under preparation. The set of rules will be enacted by the Palestinian Authority and applied by PWA in carrying out regulatory functions in the water sector. These rules are meant to satisfy the need of PWA in an intermediate period, pending full and comprehensive legislation for the sector, which needs to be developed over time. PWA will furthermore need to develop and implement the necessary tools for its functions as regulator .

In order to reach these objectives, the work will include inter alia:

a. Water Policy Amendments

- The process of formulating a comprehensive water sector policy will continue, in close co-operate with the development Water Resources Management Strategy implementation process. The activity will be a continuation of the first step towards a water policy: "Elements of the National Water Policy"

b. Water Rules and Regulations

- Prepare and submit a Draft Water Law for final approval and adoption.
- Empower PWA for performing the regulatory role in the water sector.
- Establish regulations for water resources protection and ensure enforcement.
- Activate PWA's functions for managing Palestine's water resources.
- Finalize the development of the institutional framework for the water sector, including the legal regulations, and pursue their endorsement by the Palestinian Authority.
- Empower rules and regulations for enabling integrated water resources management in Palestine.
- Resolve the legal, political and cultural complications concerning PWA taking over the established "private" water rights.
- Strengthen and start enforcement of the regulatory framework required to develop incentives to enforce and monitor compliance of water rights.
- Establish directives for addressing the issues of illegal wells and water connections and develop guidelines for appropriate resolution of these issues.
- Develop a consistent and integrated water legislation which will mandates that all relevant projects and proposals follow a consultative and transparent process with other key authorities

and stakeholders before endorsement, with the intention to avoid unnecessary gaps and contradictions in the legal framework;

- Develop the regulatory framework for restructuring and private sector participation in water and wastewater utilities, and complete the statutes for the national bulk water supply authority.

3.5.3 Build Institutional Capacity and Develop Human Resources

*** Institutional Building**

Background

Recognizing some exceptions, the different bodies and institutions, responsible for the service delivery functions either at the bulk or local levels in Palestine suffer from overall inefficient management, poor financial records. This critical situation necessitates the importance of strengthening the institutional capacities in order to raise their managerial and technical performance up to certain acceptable standards.

As stipulated from the National Water Policy the water sector should be regulated by one responsible body, with the separation of the institutional responsibility for policy and regulatory functions from those of service delivery. It is intended to establish three regional utilities in the West Bank and one in Gaza and one utility for the bulk water supply; and encourage involvement of the private sector in the funding and implementation of projects.

Objectives

The objectives of this strategic element will be to achieve the most appropriate Institutional arrangement in the water sector in the context of meeting sector sustainability.

Scope of Work

a. Water Sector Institutional Reform

- Identify challenges facing institutions within the new policy framework.
- Improve the management of water and wastewater services initially by building on existing water utilities, and then determine the appropriate water utility institutional arrangement for future development of the sector in consultation with other stakeholders;
- Continue the implementation of the water sector institutional reorganization including a detailed analysis of the roles and interactions between the institutions and stakeholders.
- Maintain the good working relationships with the National Water Council;
- Encourage the involvement of the private sector in the implementation of investment projects;
- Provide technical guidance for developing institutional capacity, planning and preparation of future water supply and sanitation service improvements.
- Ensure independent auditing, monitoring and reporting of the performance of the utility operators.

b. Economic Sustainability of PWA

- Strengthen the operational capacity and economic performance of PWA to undertake water management.
- Make an analysis of PWA's economic situation and future financing demands and sources of income.
- Develop an action plan and mechanisms for implementation.

***Human Resources Development**

Objectives

To develop the human resources base especially the technical, managerial and executive capacity that is necessary to meet the demand of the water sector institutions.

a. Capacity Building and Training

- Implement strengthening of the new institutional structure.
- Analyze the actual training needs of the sector and guide the planning and implementation of an appropriate Water Sector Training Center. The training programs will need to be better and more specifically designed for the local situation and be more systematic and interactive than the recently offered training programs.
- Continuously train and develop the staff, including promotion of good staff motivation.
- Emphasize the role of local consultants as a strong domestic resources base.

3.5.4 Improve Information Services and Assessment of Water Resources

Background

The identification and evaluation of the potentials of the water resources in Palestine has been a continuous dilemma especially over the last 30 years. Only a few comprehensive hydrological studies have been carried out on the assessment of these water resources, and the available data on the magnitude of available water resources are both scattered and incompatible.

The exceptional complexity of the hydrological pattern in Palestine through which the resources are recharged and discharged, adds to the difficulties for the exact identification and evaluation of the availability of water resources.

Objectives

The overall objective of this strategy is to present reliable water resources information to decision makers and stakeholders and to ensure that the data and analysis are used effectively in both political dialogue and development activities. The immediate activities would be: (i) compilation and characterization of Palestine's water resources base by groundwater basin; (ii) overlaying of socio-economic data on the aquifer framework, assessment of the monitoring network, data management and information services; (iii) diagnosis of critical gaps and water resource limitations in relation to development needs and water rights negotiations.

Scope of Work

a. Monitoring Networks and Information Services

- Carry out a compilation, assessment and diagnosis of available hydrological/hydro geological data in relation to development objectives and water rights negotiation.
- Identify critical gaps in hydrological/hydro geological monitoring network design, operation and ownership and initiate measures to upgrade the networks to a suitable level.
- Summarize existing hydrological/hydro-geological and water use data.
- Identify critical gaps in information processing and dissemination and initiate solutions to address them - to include packaging for use at district and community level.
- Collate available socio-economic, environmental, and land-use data on the basis of the existing framework and assemble them and in the GIS system of the Palestinian Authority.
- Identify priority programs and projects for future capital or technical assistance related to water information services.

b. Water Laboratory Services

- Support and participate in ongoing projects aimed at strengthening of water analysis services in the West Bank and Gaza.
- Establish and operate a central water quality laboratory to carry out chemical and biological analyses.
- Identify accredited laboratories in Palestine to carry out more specialized analyses
- Developing guidelines for water sampling and analyses, and upgrading the water laboratory services.

c. Water Balance Assessment

- Enhance the knowledge and information base with regard to water balance and determination of safe yields, taking full account of linkages between precipitation, surface water and groundwater in the hydrological cycle. This assessment will be of great importance as a background for the water rights issues and evaluation of alternative combinations of options of available water resources.
- Evaluate projects related to water resource availability prior to issuing of licenses to water sector investments.
- Centralizing the responsibility of hydrological services including operation and maintenance of the hydrometric stations, data collection, quality assurance, data handling, and publication of all resources data and information.
- Developing appropriate data monitoring networks for water resources .
- Building capacity for data analysis and water resources assessment and provide rational information regarding water resources and “safe yield” of aquifers for the water right issues in the negotiation of the final agreement.

3.5.5 Regulate and Co-ordinate Integrated Water Supply and Wastewater Investments and Operations

Background

Adequate and reliable water supply and wastewater infrastructure is one of the key elements needed for improving the socio-economic situation of Palestine. The investments needed for new water supply and wastewater infrastructure are estimated to be high.

Objectives

The objectives of the water supply and wastewater component is to develop regulatory and supervision tools for water and wastewater sector development, and initiate the implementation of these controlling and facilitating measures.

Scope of Work

a. Regulatory Framework and Monitoring of Utilities

- Operationalize the regulatory framework for restructuring and private sector participation in water and wastewater utilities that has been developed under strategy 2 “Policies and Regulations”.
- Determine appropriate water utility institutional arrangements in order to improve management of water and wastewater services.
- Provide technical guidance, undertake project monitoring and ensure compliance with the management contract by the regional utility operators.

b. Water Tariff Structure

- The overall water and wastewater services shall be economically sustainable covering both operational and investment costs.
- The sewerage fee shall be integrated in the water charge.
- The tariff structure shall encourage water conservation.
- Cross-subsidization will be considered a measure to provide water for basic needs at affordable prices.
- The tariff system shall be practical to implement and enforce.
- Approve and introduce the new progressing water tariff structure for the water utilities and municipalities, including fees for sewerage and for untreated industrial wastewater.
- A pollution charge shall be considered added on for industrial pollution.

c. Water Resources Master Plans

- Continue development and co-ordination of Water Resources Master Plans, and Integrated Water Resources Management Plans for all Districts and Service Areas in Palestine.
- Prioritise and prepare water and wastewater sector investment plans and associated funding requirements.
- Estimate short, medium and long term investment needs.
- Establish investment “packages” identified in the Master Plans, and promote financing of the projects through international funding institutions.
- Identify and guide urban and rural investment projects.
- Promote and supervise rehabilitation and extension projects in areas where they are most urgently required, to improve the sufficiency and efficiency of water and wastewater services to customers.
- Identify and activate funding and financing resources and mechanisms.
- Enforce consistent water demand management and enable local governments to take over this responsibility

3.5.6 Enforce Pollution Control and Protection of Water Resources

Background

Emphasis on environmental objectives through the protection of catchment areas must increase significantly to avoid further water scarcity and quality problems:

- ◇ Environmental impact assessment (EIA), including public display and hearing, should be carried out for each project with anticipated environmental effects.
- ◇ Consider the need for preparation of national EIA Guidelines in cooperation with other relevant institutions.

Objectives

The objective is to develop the appropriate and efficient legal, regulatory and institutional instruments to enforce pollution control and protection of water resources through coordinated efforts between relevant institutions.

Scope of Work

a. Pollution Control regulations

- Establish water quality and effluent discharge standards according to pollutant type and sector.
- Develop and introduce enforceable penalties and regulatory techniques.
- Prepare Guidelines and commence the operationalization of the regulations developed under strategy 2: “Policies and Regulations

- Clarify responsibilities between authorities involved in monitoring and compliance of pollution control and land use, and implement necessary re-structuring of institutional functions.
- Ensure that the water/wastewater laboratory and data processing services are operational.

b. Licenses and Pollution Abatement in High Priority Areas

- Carry out rapid identification and assessment of high priority pollution problems (“hot spots”).
- Issue discharge licenses and impose pollution control measures on the polluters in these areas.
- Follow up by implementation of water quality and pollution monitoring program.
- Prepare guidelines for customers fees and carry out billing and collection of sewerage fees and pollution charges for specific industrial discharges and large municipal plants.
- Enforce pollution control measures (construction of treatment plants, internal measures in the quarries, factories, etc.) and impose special charges on violators.
- Follow up by implementation of regular water quality and pollution monitoring programs.
- Initiate cooperation with relevant authorities and ministries in order to take the necessary and most efficient measures to protect vulnerable water resources.
- Evaluate and approve environmental impact assessment (EIA) for projects with potential environmental impacts.

3.5.7 Promote Public Awareness and Participation

Background

It is important to link the policies to people, keeping in mind that policy formulation and the setting of national priorities should occur with the involvement of all major water stakeholders (both users and managers). Stakeholders can be linked to policy-makers through existing organizations and forums at national, district and community level. The decentralization of responsibility and increasing accounting to primary stakeholders is an important success factor. As popular participation increases with an effective, two-way flow of information existing policies may need to be revised.

Awareness of water resources challenges, issues, and opportunities is an essential activity for improving water resources management in Palestine and needs to be enhanced:

- ◇ at the political level, to create understanding and commitment;
- ◇ at the executive level in PWA, as part of building capacity; and among the public, to create society-wide commitment;
- ◇ growing awareness will encourage public support of policy initiatives, such as tariff reforms, good governance, and decentralization of public decision-making;
- ◇ promoting and enabling local participation in planning, operation and management of water resources is a fundamental strategy for achieving sustainable development. Local involvement is a key to ensuring water demand management to monitor the performance of public and private institutions;
- ◇ local participation and unity is a cultural tradition in Palestine, rooted perhaps in coping strategies for collective survival under difficult conditions. It would be possible to benefit from this tradition to promote public involvement and enhance water resources responsibility and management in society at large. PWA should also consider to incorporate community members in the preparation and implementation of projects.

Objectives

The main objective of this strategy is to create incentives for a broad public commitment in order to enhancing participation of stakeholders in water management, and establish immediate and long term institutional and financing solutions for promotion of public awareness and participation .

Scope of Work

a. Public Awareness

- Inform systematically about projects in mass media, Internet, pamphlets, etc.
- Implement a campaign to enhance the understanding of the need for water conservation and to prioritise the water allocation to economic sectors, such as agriculture and industry.
- Make public display and hear a mandatory part of the project preparation procedure.
- Encourage the Ministry of Education to include education in the understanding of the need for conservation and protection of water in the curriculum for all levels.

7.2 Stakeholder Involvement

- Create understanding and commitment at the political level.
- Identify constraints and opportunities to promoting a participatory approach to water management.
- Ensure widespread consultation in the process of completing and implementing the strategy through a "water forum" or similar instruments.
- Make public hearing a mandatory part of the procedure for preparation of new projects.

3.6. Implementation of the Strategy

3.6.1 Approach

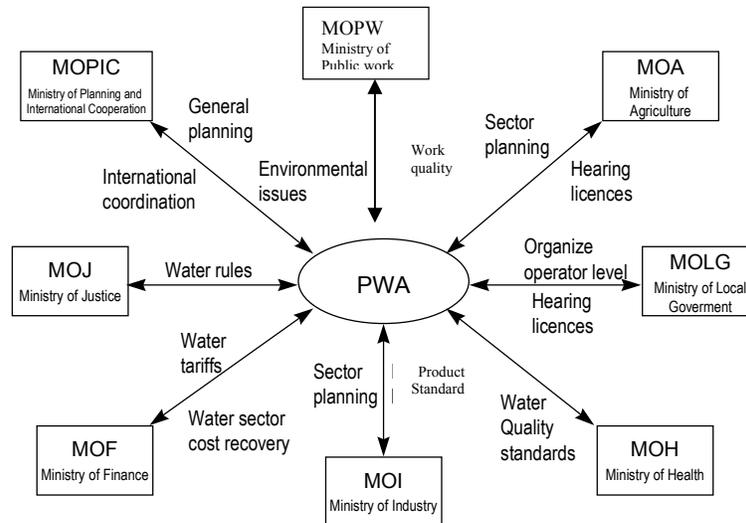
The institutional and regulatory framework for water resources management in Palestine will have to cope with a situation of growing water demand, deteriorating quality and conflict between different user categories as well as issues of water rights between neighboring countries. The needed approach to completion and implementation of the Water Management Strategy is the one that builds and utilizes local capacity and strengthens ownership, commitment and awareness among local institutions - public, private, non-governmental - and more broadly with civil society.

3.6.2 Institutional Arrangement

The implementation of the Water Management Strategy will entail specific analysis and actions related to a range of physical, hydrological, water use, institutional, human resources, economic, and environmental issues affecting the sector. An important aim of the implementation process is to strengthen national capacity for carrying out complex, multi-sectorial management and regulations in the water sector. The implementation of the Water Management Strategy will be a participatory process involving PWA staff and other key institutions and stakeholders such as the national water council, water related ministries, municipalities, and organizations in conjunction with limited outside experts if necessary, to carry out specific tasks.

There are a large number of stakeholders and in figure 6.1 some of the main connection with the ministries are identified. After the adoption of the Water Strategy one important step for PWA will be to invite the involved ministries and authorities to take part in the implementation and to establish a framework for the cooperation.

Main interfaces with Ministries



Framework for PWA Cooperation with Main Ministries

The implementation will be organized by PWA, being the focal water resources management authority in cooperation with relevant stakeholders. The responsibility for elaborating each of the seven key elements of the strategy should be shared between the departments according to their main areas of responsibility as presented in Figure 6.1. It is, however, important to keep enough flexibility and cooperation in the system to allow the best possible staff teams for the respective tasks, and to facilitate future adjustments and required redistribution of responsibilities.

An implementation Task Force within PWA has been formed in order to achieve this flexibility and cooperation.

Strategic Element	Responsible Unit				
	Co-ordination and Public Relations Unit	Water Resources & Planning & Strategy Directorate	Regulatory Directorate	Technical Directorate	Administrative Directorate
1. Palestinians' Water Rights	■	■	■		
2. Policies and Regulations	■	■	■	■	
3. Institutional and Human Resources	■	■	■	■	■
4. Information and Water Resources Assessment	■	■	■	■	
5. Water Supply and Sanitation Regulation	■	■	■	■	
6. Pollution Control and Resources Protection		■	■	■	
7. Public Awareness and Participation	■	■	■	■	■
Primary Responsibility	■				
Participation	■				

indicative Sharing of Responsibilities for Strategy Implementation with PWA

3.6.3 Phasing

The figure below gives an overview of the time schedule for the implementation. The implementation of additional studies and accomplishment of water management actions according to agreed task descriptions. The periods of intensive activity versus periods of more routine-like work varies for each implementation block.

	1998-2000	2001-2002	2003-2005
Implementation			
1. Palestinian Water Rights	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆
2. Policies and Regulations	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆
3. Institutions and Human Resources	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆
4. Information & Resource Assessment	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆
5. Water Supply and Sanitation Regulation	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆
6. Pollution Control and Resource Protection	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆
7. Public Awareness & Participation	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆	◆◆◆◆◆◆◆◆
Intensive Activity: ◆◆◆◆◆◆◆◆			
Periodic Activity: *****			

3.6.4 Funding of the Implementation

PWA has submitted a project document(Phase 2) to Norwegian Government (NORAD)with a request for continuing support to institutional building from 1998 to 2000 with a budget of 57mill NOK. This budget has already been approved by NORAD. This program will cover most of the funding needed for institutional building to supplement what is already in place from other donors. The implementation process was extended until 2002. The Netherlands has agreed to join the Norwegian Government in its program for the third phase.

4. ASPECTS OF WATER RESOURCES

4.1 Introduction.

The West Bank and the Gaza Strip are those parts of historic Palestine which were occupied by the Israeli army during the June 1967 war. Palestine is bound by the Mediterranean Sea in the west, by Jordan and Syria in the east, by Lebanon in the north and by the Sinai Peninsula in the south. The total area of historic Palestine is 27,024km² extending for approximately 400km in length and 80km in width.

The West Bank with an area of 5572 km² (approximately 155km in length and 60 km in width) is mainly a mountainous region, but it contains the western bank of the Jordan River between the Basin Valley in the north and the Dead Sea in the south, as well as small areas in the semi coastal plain in Tulkarem and Qalqilia.

The Gaza Strip with an area of 367 km² (approximately 45 km in length and 7 to 12 km in width) is situated in the southern part of the coastal plain.

The last census in Palestine was carried out by the Palestinian Bureau of Statistics in 1997. The total population (excluding East Jerusalem) is estimated at approximately 2.6 million.

The West Bank has an average population density of approximately 250 persons per km², while the Gaza Strip has an average population of approximately 2,297 persons per km².

4.2 Land Use

Table 4.1 shows the land use classification for the year 1993.

Classification	West Bank		Gaza Strip	
	Area(km ²)	Percentage from total	Area (km ²)	Percentage from total
Various Forms of Agriculture	1783	32	179	49
- Irrigated by Palestinians	100			
- Irrigated by Israeli Settlers	40			
Built-up areas and public infrastructure	334	6	69.7	19
Forests, pastures and grazing lands	1783	32	12	3
Unusable land	1672	30	106	29
Total areas	5572	100	367	100

Table 4.1 Land use in Palestine (1993)

4.3 Climate

The climate of Palestine is of the Mediterranean type. There are two distinct climatic seasons, a wet winter and a dry hot summer. The rainy season extended from mid- November to the end of April with the lowest temperatures occurring in January and February, with maximum rainfall in January.

There is an abundance of sunshine in Palestine with an average radiation of 5000- 7500 kcal/square meter per day in the summer.

4.3.1. Temperature.

The average annual temperature for the western plains of the West Bank is 19degree C, while it is 17 degree for the mountainous region and 25 degree for the Jordan Valley. The average annual temperature in the Gaza Strip is about 21 degree C.

The average relative humidity in the West Bank varies from 50% to 70%. The minimum humidity occurs in June, while the maximum occurs in January. Because of its proximity to the Mediterranean Sea, the relative humidity in the Gaza Strip is higher than that in the West Bank, and ranging from 70% to 85%.

4.3.2 Evapotranspiration.

No direct evapotranspiration measurements are available for Palestine. Annual pan evaporation rates for the western parts of the West Bank are 1,900 mm/yr, while for the Jordan Valley around Jericho pan evaporation rates reach 2,600 mm/yr.

Typical pan evaporation rates for the Gaza Strip range from 2.1 mm/day in winter to 6.3mm/day in summer. Annual average pan evaporation rates in Gaza are about 1,900 mm/a. throughout the warm

season in the GS there is a soil moisture deficit which requires irrigation for cultivating crops. Only a few crop varieties with the ability to withstand water stress area able to survive the summer in the Gaza Strip.

4.3.3 Population.

The last census in Palestine was carried out by the Palestinian Bureau of Statistics in 1997. The total population (excluding East Jerusalem) is estimated at approximately 2.6 million. 62% live in the West Bank while the remaining 38% live in the Gaza Strip, while it is estimated that about 300000 inhabitant live in eastern Jerusalem. The West Bank has an average population density of approximately 287 persons per km², while the Gaza Strip has an average population density of approximately 2,724 persons per km².

The population growth rate in Palestine for the last five years ranged from 3.2% to 3.5% Demographic trends in Palestine have been related to the political development in the region.

The population is generally young. About 80% of the West Bank population and 75% of the Gaza Strip population are below 35 years of age. Israeli imposed restrictions on economic development and land and water use during the last 30 years coupled with the absence of major local investment, resulted in a noncompliance between population and resources, especially water resources.

4.3.4 Population Projections.

When considering or estimating the future population in Palestine, many factors have been taken into consideration such as the future population policies, population growth rates, immigration and the density of communities in Palestine. the situation of uncertainty regarding the mentioned factors requires proposing different scenarios namely low medium and high population estimates. Figure 1.2 illustrates the base scenario for population projections assuming that 0.5 million of Palestinian will return gradually to Palestine by year 2000. Population projections will be affected by the percentage natural growths which were estimated to range between 2-3% over 40 years (Middle East Regional Study on Water Supply and Demand Development,1996).

4.4 Water Resources in Palestine: Potentialities and Utilization.

4.4.1 West Bank

Before 1967, a total number of 774 wells had been drilled for irrigation purposes and domestic use in the West Bank. Currently (year 2000/2001) only 321 wells are still operating, and the rest have been abandoned, either because they were dried up due to their shallow depths, or were located in a military restricted area such as in the Jordan Valley. Others were not economically feasible to be operated due to their quantity of discharge and the high cost of operational or due to old age need to be rehabilitated. In 1976, the Israeli administration imposed and enforced regulatory measures (Military Orders No.158 and No.92, 1976/77) restricting the quantities of water to be abstracted from the operating wells for agricultural usage, which consequently limited the irrigated areas. Through the period 1976-1994 the Israeli administration also did not allow any new drilling for agricultural purposes, except for a few substitute wells.

A major source for agriculture is springs water, which yields a mean annual flow of 56 MCM. However, no spring development whatsoever has taken place, which is a factor hindering the expansion of the cultivated area.

Even through between 1967 and 1994, the Israeli administration allowed the drilling of only 29 new wells to be operated solely for domestic use, the water supply from these wells did not meet the minimum demand for the existing Palestinian community.

4.4.2 Gaza Strip.

In the Gaza Strip groundwater, the major source for water supply, is confined in the coastal aquifer and it is already being exploited beyond the level of natural recharge. Approximately 70% of the water is used for irrigation. It is estimated that there are 2000 registered agricultural wells in addition to 1000 unlicensed wells. The quality of the groundwater water is the main available fresh water in the aquifer.

4.5 Hydrologic Cycle.

4.5.1 Rainfall.

The water sources in Palestine come from the rainwater and sometimes from the snow, which falls during the winter season. The total annual rainfall has a large of variation from year to year and from location to location. Rainfall ranges from 150 mm/yr. in the Jordan valley to 700-1100 mm/yr. in the mountainous part of the West Bank. The mean number of rainy days per year ranges form 55 in the western part to 25 days in the eastern part.

The total annual rainfall in the winter season (October-May) determines the volume of recharge to the groundwater. Water is lost mainly by evapotranspiration, which constitutes the largest factor. Water is also lost by surface runoff, which constitutes a very small portion of potential losses. The nature of surface runoff, which constitutes a very small portion of potential losses is affected by the nature of the fractured and karstic limestone formations that outcrop in most of the West Bank. The long-term average annual rainfall for the West Bank has been estimated at 425mm.

Annual rainfall in the Gaza Strip, although the area is small, varies from about 400mm in the northern part 300mm in the middle area, to about 200mm in the southern part, with an overall annual average of 275mm.

4.5.2 Surface Water Resources.

Table 4.2 summarizes the available surface water (rivers and wadis) resource sin Palestine

A- Jordan River Basin	(MCM/Yr.)
Average Surface Flow	1311
Palestinian Share	257
B – Seasonal Wadis	(MCM/Yr.)
Eastern Wadis of the West Bank (Jordan Valley)*	31.4
Western Wadis of the West Bank (Mediterranean Sea)*	63.7
Wadi Gaza	2
Total	97.1

- Table 4.2: Available surface water in Palestine (West Bank Integrated Water Resources management Plan, 2002)

4.5.3 Groundwater Resources.

The available groundwater is all renewable and is replenished by the rains and sometimes snow that falls during the winter season. The groundwater is found in shallow, intermediate, and deep seated aquifers ranging in depths from tens of meters to several hundreds of meters (from the Pleistocene gravels to the Lower Cenomanian lime stones).

There are six known aquifers in Palestine namely the Pleistocene, Neogene, Eocene, Turonian, Upper Cenomanian and Lower Cenomanian.

Table 4.3: Available Groundwater in Palestine.

Basin	Yield (MCM/yr).
a- West Bank Basins	
Eastern	172
North-Eastern	145
Western	362
Total West Bank	679
b- Total Gaza Strip	55
Total/Palestine	734

Source: Article 40 of the Oslo 2 Agreement

i. Springs

There are more than 500 springs and seeps distributed all over the West Bank, 303 springs had historical measurements with a total reported discharge about 56 mcm. Most of springs and seeps supply fresh water of excellent quality, and other springs supply brackish water, especially Dead Sea springs. The flow of the fresh water springs is used mainly for irrigation with only 16 springs for domestic purposes used to supply Palestinian communities with water through public water network. The brackish water springs which are located along the northern and western shores of the Dead Sea, are partially utilized at present by the Israelis for irrigation of palm trees and for recreation purposes.

In the West Bank, natural and structural springs and seeps issue their water from the limestone or dolomitic limestone water-bearing formations where the water intersects the land surface or by deep-seated faults and joints.

4.5.4 Flood Water

i. Natural Runoff.

Surface runoff in Palestine is intermittent and it occurs only in the event of high rainfall intensity. In the West Bank there were only three flood monitoring stations, namely Wadi Qilt/Jericho, Wadi Fari'/Jiftlik, and Wadi Maleh/Hammam Maleh. However, these monitoring stations have been destroyed during the first Intifada. Thus, small amount of accurate data for surface runoff through these wadis is available. There are other wadis in the West Bank that do not have any measuring monitoring stations. Of the surface drainage basins in the West Bank that do for runoff along wadis, there is an estimated 70 MCM/yr, of rainfall water lost through surface runoff. Some of this runoff could be utilized through water storage projects.

In the Gaza Strip, there are only three dry wadis: Wadi Gaza in the central part, Wadi Halib draining the depression of Beit Hanoun, and Wadi Salkaa fossil river. The Ministry of agriculture has estimated the temporary runoff in Gaza Strip to be about 25 MCM/yr.

ii. Urban Runoff.

Ten of the West Bank municipalities have storm-water collection systems. Nine of these have combined sewer systems and only one has a separate storm-water draining system.

Estimated urban annual runoff is about 14 MCM. However, most of this runoff is lost. Only minimum amounts are utilized in rainfed cisterns to supply needed domestic water.

Utilization of urban runoff could be done through expanding the use of rainfed cisterns. However, such systems are difficult to monitor for water quality and thus there might be a negative health impact. The other possibility is constructing small earth dams on the wadis draining from the cities to utilize urban and runoff for agricultural purposes or to enhance groundwater recharge.

4.5.5 Water Balance.

The groundwater recharge in Palestine is the direct infiltration of rainwater through fractured, karstic rocks and porous soils. The overall estimated natural recharge in Palestine is about 703 MCM/yr (see table 4.4 below).

Hydrologic Parameter	West Bank		Gaza Strip		Total
	Contribution to Water Balance		Contribution to Water Balance		
	Percentage	MCM/yr	Percentage	MCM/yr	MCM/yr.
Annual Rainfall	100	2248	100	101	2349
Evapotranspiration	- 68	-1529	-52.5	-53	-1582
Surface Runoff	-3.2	-71	-1.98	-2	-72
Natural recharge	28.8	648	45.5	46	694
Return Flow		RFWB	8.9	9	9+RFWB
Overall Balance		648+RFWB		55	703+RFWB

Table 4.4: Water Balance in Palestine.

4.5.6 Quality of Water Resources.

Water qualities from springs and wells in the West Bank are reported to be good, except in the Jordan River Valley where the groundwater (Pleistocene aquifer) is poor and salinity is high. In addition, there is a high potential for biological and other contaminant pollution, since untreated domestic wastewater continues to be discharged into the wadis as well as on agricultural land. New studies indicated some anthropological pollution in some wells.

In the Gaza Strip, the quality of groundwater is very poor. Water quality has deteriorated severely for a number of reasons. The most important is that sea water has intruded into the coastal aquifer due to over pumping. In addition, the fertilizers, pesticides and raw sewage water used in agriculture add to the pollution problem.

4.4.7 Water Consumption.

During the recent surveys on present water consumption in Palestine (1995), the industrial consumption could not be separated from domestic water consumption, therefore it is included in the figures of domestic water consumption.

Palestinian consumption from the groundwater resources (springs and wells) in the West Bank has been estimated at about 127.4 mcm for irrigation, domestic and industrial uses. The distribution of these quantities is shown in Table 2.2.

In Gaza, Palestinians are using about 103 mcm/yr, from groundwater. With a safe yield of only 55 mcm/yr, there is an over pumping of about 87%, and it is for this reason that groundwater quality is deteriorating.

The total water consumption in Palestine was estimated at 235.45 mcm/yr. In addition to that amount, 60 mcm/yr, are used by the Israeli settlements in both Gaza and the West Bank.

Location	Water Supply to the Palestinians MCM/yr				Water Consumption MCM/yr.			
	Wells	Springs	Improted	Total	Domestic and Industry	Agric	Israeli settlements	Total
West Bank	64.7	56.6	6.1	127.4	37.45	90.0	50.0	177.45
Gaza strip	103	0	5.0	108.0	48.0	60.0	10.0	118.0
Total	167.7	56.6	11.1	235.4	85.45	150.0	60.0	295.45

Table 4.5: Summary of Water Supply and Consumption in Palestine.

4.4.8 Current Demand.

The historic water consumption in the West Bank and Gaza Strip has been severely constrained due to the scarcity of the resource, high losses in the distribution networks and poor services. Accordingly, current water consumption does not reflect the actual current demand and cannot be used to predict future demands.

In general the per capita water consumption is maximum when the below listed criteria are met:

- The ability of water resources to meet the consumers' water demand.
- The ability of water resources to accommodate the optimum capacity of the water distribution system.
- The ability of water distribution network and conveyance system to meet consumers' demand
- Consumers ability to pay for the services.
- The community's financial ability and political inclination to subsidize water tariffs to fulfill water consumption needs.

Such conditions are only valid when the resource is relatively unlimited and where the consumers are paying for water supply and sewage treatment according to water consumption

4.6 Water Resources Requirements.

4.6.1 Demand Scenarios.

Based on the estimated demand projections, there will be a growing disparity between water demand and existing resources unless additional water resources are mobilized and developed immediately. Before this growing disparity between the demand and the available sources is discussed, water resources availability needs to be assessed.

Due to the difficulties in predicting future demand from the current per capita consumption, it is vitally important to develop scenarios that can help make these forecasts. The Middle East Regional Study on Supply and Demand 1995, had developed three scenarios for the estimation of future per capita consumption. Table 3.1 shows the total demand for the base scenario which comprises demands for municipal, industrial and irrigation water.

	2001		2005		2010		2015		2020	
	WB	GS	WB	GS	WB	GS	WB	GS	WB	GS
Domestic & industry	70	63.5	88.4	99.6	127.7	124.2	178.8	151.2	239.3	182
Agriculture	146	91.5	149.6	92.2	167.3	88.3	205.9	83.7	316.1	79.7
Subtotal	216.9	155	238	191.8	295	212.5	384.8	234.9	503.3	261.7
Total	371.9		429.8		507.8		619.7		720	

Table 4.6 Project Demand, (mcm) for Palestine (Bas Scenario).

Source: West Bank integrated water resources management plan 2002, and CAMP Report

4.6.2 Per Capita Consumption

The present domestic per capita consumption in the West Bank is estimated at 29.5m³/yr, including 41.1% unaccounted-for water. In the Gaza Strip this figure is around 39 m³/yr. As mentioned earlier, the current consumption is not the actual demand due to many political, and technical constraints accordingly the figures of per capita not be used for predicting future consumption in the various sectors. For comparison, the per capita consumption for domestic water use in Jordan is 53m³/yr, and in Israeli this figure reaches 100 m³/yr.

Three scenarios were developed for the estimation of the future per capita water consumption. These are referred to as low, base and high scenarios.

In the base scenario, it is assumed that a rapid development and growth stage after the year In the base scenario , it is assumed that a rapid development and growth stage after the year 2000 will take place. This will lead to an increase in the living standards and perhaps will reach to a semi-sustainable economic growth that will allow for an increase in the per capita income. Based on this scenario, it was assumed the increase in the per capita consumption is 2.5%. table 3.2 shows these projections for the years 2000, 2010,2020 and 2040.

Year	Palestine m ³ /yr	Jordan m ³ /yr	Israel m ³ /yr
2000	50	74	105
2010	57	72	115
2040	83	86	145

Table 4.7 Per Capita Annual Water Demand for the Base Scenario

4.6 Wastewater

4.7.1 Reclaimed Wastewater in the West Bank.

Reclaiming wastewater for reuse requires collection, treatment and reuse systems. However, rural areas in the West Bank either don't have running water at all or don't have wastewater collection systems, even if they have running water. In villages, wastewater is collected in individual waste pits or cisterns where it infiltrates into the ground. Thus, there is in reality no wastewater to be reclaimed in the rural areas of the West Bank.

In urban areas, water is distributed in water networks. However, not all urban areas have collection systems for wastewater. Thus, only some urban areas can be considered for potential wastewater reuse, i.e. the ten cities with collection systems for wastewater and/or urban storm water. Thus, reclaiming wastewater in these cities will also include urban storm runoff.

At times, untreated wastewater is utilized for irrigating some vegetables, in both Nablus and Bethlehem. Such utilization is causing severe health effects on the public. There is no one single complete and safe wastewater reuse project in the West Bank.

The houses connected to wastewater collection systems consume about 12 MCM/yr., in the West Bank. Assuming that 80% of that amount is collected into a wastewater collection system, then the total amount of wastewater that could be utilized for reuse after constructing efficient treatment plants will be about 10 mcm/yr, or about 27% of the total water consumed in the West Bank. It was assumed that 80% of water will return to the wastewater collection system (when a house is connected to one) because most of the water usually returns to the system as minimal amounts are used in gardening (lawns are minimal in West Bank urban areas). Constructing efficient treatment plants in the nine municipalities could be done by 2010. Thus, by 2010 only 27% of water consumed in the West Bank could be utilized for wastewater reuse in agriculture.

4.7.2 Potential Wastewater Reuse.

To utilize wastewater for reuse in the West Bank, wastewater collection and treatment systems should be established and/or rehabilitated to operate efficiently. Such development requires large investment and gradual or staged timing. Therefore, the amounts of wastewater that could be utilized for reuse will increase gradually with time to correspond with the development of wastewater infrastructures in the West Bank. Timing of this development will depend on available funding for such projects, the size of population and the local government structures in the residential areas of the West Bank. Thus, residential areas are divided into the following three categories according to population:

- i.** Urban areas (municipalities) with existing wastewater collection systems: The population of these areas was 514,611 in 1994, or 37% of the total population. Wastewater reuse in these areas requires construction and rehabilitation of wastewater treatment systems. Thus, possible wastewater utilization could be done by 2010.
- ii.** Urban areas (municipalities) without existing wastewater collection systems: Population of these areas was 167,419 in 1994 or 12% of the total population. Wastewater treatment and collection systems need to be constructed. Thus, possible wastewater utilization could be done in 2020.

- iii. Villages with population more than 3500 in 1994: the population of these villages was 305733 in 1994, or 22% of the total population. These villages are expected to be recognized as municipalities by 2040. Considering natural growth, it is expected that each one of these villages will have a population of 1000 or more by 2040 wastewater reuse requires construction of wastewater treatment and collection systems. thus, possible wastewater utilization could be done in 2040.

4.8 Present Economic Aspects in the Water Sector.

4.8.1 Present Water Production Cost.

The current responsible institutions for running the drinking water extraction and distribution are regional utilities, municipal departments, village committees, village councils UNRWA offices. The water for agriculture is either operated by individual farmers or families or by collective or cooperative management, such as the Faria project in the Jordan Valley.

These different bodies suffer from overall inefficient management, poor financial records, from high unaccounted –for- water and do not have any sound financial records that one can rely on and use in deciding the present or actual costs for extracting and distributing the water. Thus, it is difficult to get the necessary information or the present cost of water that is needed for documented calculations.

In the Gaza Strip, agriculture is the largest water consumer. It uses about 70% of the total consumption. The cost of supplying irrigation water in the Gaza Strip, according to the World Bank in 1993, was around 12-14 cents per cubic meter, while the agricultural tariff is close to zero. The main reason for the low cost is related to farming on land with a very high groundwater table, or water exploited through private wells, The implication of this is that present costs in the Gaza Strip do not reflect the true value of water, and it does not include the real cost (capital cost, depreciation and services). The high level of losses has made the production cost greater than the price of water and thus no municipal department is balanced financially in both the West Bank and the Gaza Strip.

4.8.2 Present Cost Recovery.

At present, full cost recovery has not been achieved by water suppliers for both domestic and agricultural use. even though some utilities have achieved operation and maintenance (O & M) cost recovery, it should be pointed out that none has achieved the full cost recovery of both the O & M and the capital costs. This situation is not solely due to the existing socio-economic factors or to the affordability of payment of the public, as there are other internal and external factors within the utilities and their surrounding environment.

One of the most important causes of the inability to achieve cost recovery in the Palestinian water authorities is the high percentage of unaccounted -for- water which reaches in certain cases 60%. The small scale of the water networks, the poor management and the inappropriate pricing policies are other main obstacles.

4.8.3 Present Marginal Water Costs.

The marginal cost of water is the cost of producing and distributing the additional quantities needed to cover demand, including covering the needs of localities without piped networks, industry and agriculture.

In Palestine there is lack of elasticity in covering the water demand due to limited financial resources which are needed for investment in the infrastructure, lack of plans, the existing political situation and the institutional and operational shortcomings of the water institutions.

Therefore, it is assumed that the existing Palestinian needs will take at least 3-4 years to be covered. The outcome of the Palestinian Israeli Peace talks concerning water issues was supposed to be the agreement of both sides on doubling the water quantities the Palestinians can extract in order to cover the immediate Palestinian needs over the coming 3 years. However, the Palestinian water rights in the water resources in the West Bank have not been defined, the whole issue of water rights has been shifted to the final stage talks when dispute issues will be negotiated.

Therefore, when calculating the present marginal cost of water in a simple presentable way, certain assumptions must be made concerning quantities, investment, average depreciation ratio for assets and infrastructure capital and energy cost (according to different scenarios).